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PLANNING AND PLAN IMPLEMENTATION

GOSPLAN OFFICIALS DISCUSS VARIOUS ASPECTS OF PLANNING

End Results in Planning

Moscow PLANOVoyE KHOZYAYSTVO in Russian No 10, Oct 80 pp 27-36

[Article by Yu. Muntyan, chief of a subdepartment of USSR Gosplan, and G. Kiperman, chief of a sector of the Scientific Research Institute of Planning and Norms attached to USSR Gosplan: "The End National Economic Results in Planning"*/

[Text/ The depth and fruitfulness of the demand advanced by the 25th CPSU Congress to direct administrative, and first of all planning, activity toward the end national economic results, which conforms to the peculiarities of the present stage of the development of the Soviet economy, are becoming more and more evident at the final stage of the 10th Five-Year Plan.

A system of measures, the most important feature of which is the more complete orientation of planning and economic activity toward the increase of production efficiency and work quality and the achievement of the highest end national economic results, is specified in the July (1979) decrees of the party and the government on the improvement of the economic mechanism. The indicated problems should be solved comprehensively, covering the organization and structure of management, planning, financing and the extension of credit, pricing, measures on the organization of labor and wages, economic stimulation and socialist competition.

Such a many-sided approach is connected with objective factors--the increase of the scale of production, the complication of production ties, the intensification of the social division of labor, specialization and cooperation. The effectiveness of the activity of every collective is being determined more and more not only by its own efforts, but also by the work of many other collectives, which are directly or indirectly connected with it in many directions of economic activity. It is possible to achieve the necessary cooperation of enterprises and associations, planning, design and scientific research organizations and other participants in production by aiming each one at the achievement of a better end result--the sum of joint labor.

A resolute turn at all levels of management toward intensive methods of management of the economy, toward the achievement of an increase of the volume of production and rendered nonproductive services not by the additional involvement of material,

* For purposes of discussion.

manpower and financial resources, but by means of their better utilization is becoming more and more urgent. This makes it possible to avoid unjustified expenses and to decrease the total outlays per unit of production and services.

The greater and greater orientation toward the end results is also caused by the increase of the demands on the quality of means of production and consumer goods. Perhaps precisely the quality of items along with the efficiency of their production attests most completely to the conformity of the labor inputs made at different stages of the production process to the achievement of the best end results.

The improvement of the tools of labor is the main motive force of the development of social production. Production efficiency depends on the quickest possible development and commitment to production of machines, devices, equipment and instruments, which embody the latest scientific and technical achievements. K. Marx noted that "as large-scale industry develops, the creation of true wealth becomes less dependent on working time and the amount of consumed labor than on the capacity of the factors, which are put into operation during the working time...."¹

High product quality ensures a decrease of the socially necessary expenditures of labor, promotes an increase of its productivity and thereby prepares the conditions for an increase of production. The improvement of the technical and economic attributes, the lengthening of the service life and the increase of the reliability of machines make it possible, given the same amount of production, to meet more completely public demands and the needs of workers. And this is the main end result of production.

The end results cannot be characterized by any one indicator, even if it is a general one. In this connection the debates over precisely what to consider as the end result--the output or the profit, the increase of labor productivity or the improvement of product quality and so on--in our opinion, are unpromising. Various characterizations of the end results are possible. The principal one is the output, which conveys the main goal of socialist production--the meeting of social demands, first of all for material goods, products. All others, no matter how important they are in themselves, are secondary and are derived from the demands for material wealth. Therefore economic indicators, which characterize the output, should first of all conform to the demand for an orientation toward the end results.

The system of physical and value indicators does not yet fully meet this requirement. It is well known that the planning of the production of individual types of machinery and equipment is still carried out in tons. Meanwhile the customer needs not the weight of the machine, but its ability to perform work, and with a specific impact. It is easier for the producer to fulfill the plan in tons. It is clear that the national economic interests do not coincide with the interests of the customers.

The planning of the production of steel pipe in tons and of reinforced concrete pipe in cubic meters does not meet the requirements. Neither tons nor "cubes" can satisfy customers, since they do not reflect the consumer attributes of the products.

1. K. Marx, "From Unpublished Manuscripts," BOL'SHEVIK, No 11-12, 1939, p 61.

The rejection of "gross" measurers, which was specified by the decree of the CPSU Central Committee and the USSR Council of Ministers on the improvement of the economic mechanism, and their replacement with others, which characterize more accurately the contribution of each collective, will promote an orientation toward the end results.

It is a question first of all of the indicator of the standard net output. Its advantages were demonstrated during an extensive economic experiment in industry. But with the solution of the question of defining the profitability in the processing sectors of industry according to the types of output as the ratio of the profit to the production cost less the cost of the used raw materials, fuel, power, materials, semimanufactures and components, that is, to the enterprises' own expenses, the last item of its criticism--the sensitivity to the materials-output ratio through the profit--is also eliminated.

The main value of the standard net output is that it makes it possible to characterize objectively the results of labor and eliminates the possibility of a "play" on the assortment and the increase of the materials-output ratio. Conditions, which bring the measurement of the results of production closer to the socially necessary expenditures of labor, are created with the introduction of stable economic indicators of the net output. When making an evaluation according to the standard net output only one way remains to increase labor productivity--the reduction of the labor-output ratio, the efficient use of working time, the introduction of new equipment, that is, the real improvement of the end results of production.

But the advantages of the standard net output are not automatically ensured, their realization requires much organizational and methods work. The adopted Methods Instructions on the Procedure of Elaborating and Using in Planning the Indicator of the Net (Standard) Output are model instructions and do not take into account the peculiarities of the individual sectors. In our opinion, they should be reflected in the sectorial directions and instructions. In particular, the mechanical inclusion of the profit in the standards of the net output in the same amount as in the wholesale prices (on the basis of different standards of the profitability to the internal expenditures) can increase the different profitability of the production of items and increase the influence of structural shifts on the fulfillment of the plan and the growth rate of the standard net output. As a result the objectivity of the evaluation of the operation of enterprises and the effectiveness of the use of the new indicator, especially for the planning of wages according to stable standards, will decrease. This is connected with the fact that different demands are made on wholesale prices and the standards of the net output. The former should provide every enterprise with normal conditions for expanded reproduction, that is, should envisage the appropriate amount of profit in the wholesale price of each item with allowance made for the cost accounting interrelations of the suppliers with the customers, while the latter have no direct bearing on this problem.

When developing the standards the requirement of the best reflection of the real contribution of the collectives to the development of social production can be met more completely. But for this the profit for each enterprise according to the entire list of products being manufactured should be included in the standards of the net output, as a rule, according to a uniform percentage of the profitability to the internal expenditures.

The solution of other methods and organizational questions of the use of the indicator of the standard net output, which arise in the process of converting enterprises to this indicator, in order to prevent unjustified duplication should, in our opinion, be concentrated either in USSR Gosplan or in the State Committee for Prices. In our opinion, all questions of a methods and organizational nature should be solved in USSR Gosplan, while questions of the formation, proper determination and use of the standards should be solved in the State Committee for Prices.

The indicators characterizing the end results are dissimilar for different units and levels of management. For the enterprise the most important of them are the following: the net output and the efficiency of its production (including the increase of the profit or the decrease of the production cost); the fulfillment of obligations on deliveries; the product quality. For each supply enterprise the observance of the interests of the national economy should be displayed first of all in the precise fulfillment of contracts and orders. Therefore it is necessary, as is specified in the decree of the CPSU Central Committee and the USSR Council of Ministers on the improvement of the economic mechanism, to evaluate the results of the activity of enterprises, as well as their stimulation on the basis of the fulfillment of the plans of deliveries of products according to the list and on time in conformity with concluded contracts (orders). At present the indicator of the sales volume with allowance made for the observance of obligations on deliveries occupies an important place in the evaluation of the operation of enterprises and associations. However, the procedure of determining and using it is regulated by instructions which were drawn up in 1977, that is, before the issuing of the mentioned decree. Of course, it requires improvement.

At many enterprises the nonfulfillment of obligations on contracts and orders has almost no effect on the amounts of their incentive funds, since the decrease of the deductions from the profit for underdeliveries of products is offset by the increase of the deductions for the material incentive fund for the increase of labor productivity or the increase of the proportion of output of the highest quality category. Meanwhile the losses of the national economy from the disruption of deliveries usually exceed by many times the gains from the increase of labor productivity and the proportion of output of the highest quality category at one supply enterprise or another. In our opinion, it seems advisable in case of a substantial nonfulfillment of the obligations on deliveries (for example, in excess of 5 percent) not to make additional deductions for the overfulfillment of the plan according to other indicators or to make them according to reduced standards.

The time factor is of great importance in the drive for high end results. Its consideration makes it possible to avoid situations, in which the contractual obligations of the first quarter are met in the second or even fourth quarter, while the deductions for incentive funds remain the same. If society has borne losses, this should affect the amounts of the incentive funds of the enterprises to blame for the losses. The maximum percentage of underdeliveries, which is allowed by the instructions, seems like an anachronism. Enterprises regard it as some standard, with the observance of which it is possible to let related industries down almost with impunity. The percentage of underdeliveries of means of production, with the exceeding of which the managerial personnel of enterprises are deprived of bonuses, is set by USSR Gosplan, while that of consumer goods is set by the ministries. Moreover, different maximum percentages of underdeliveries are often set for enterprises which are under different production conditions. This is one of the examples

of planning "from what has been achieved" instead of the use of estimates and standards.

It is necessary to determine the procedure of the annual reduction of the indicated percentage, so that by the end of the five-year plan it would not exceed 1-2 percent. It is expedient to set the percentage of underdeliveries of consumer goods upon the approval of the USSR Ministry of Trade or the ministries of trade of the union republics. The scales of the deprivation of bonuses for the underdelivery of products to clients, which are used in the ministries, also have shortcomings. At a number of enterprises of the Ministry of the Machine Tool and Tool Building Industry due to the lack of a standard scale in case of the underdelivery of products in the amount of 6 to 6.7 percent the bonuses are reduced by 50 percent, while in the amount of 6.8 percent they are reduced by 100 percent. In our opinion, it would be more correct to decrease the amounts of the bonuses as the maximum percentage of underdeliveries is approached.

The problem of increasing the demands on the awarding of the honorary pentagon to items is now acquiring particular importance. This is connected with the fact that the number of descriptions of items with the Seal of Quality has reached 83,600 (on 1 August 1980), while the proportion of products of the highest category in the total volume comes to 15 percent. The stimulation of their output, which is stipulated by the July (1979) decree of the CPSU Central Committee and the USSR Council of Ministers, is sufficiently effective. At the same time the production of items of the second quality category is practically not penalized. For industry as a whole the amount of the markups on the wholesale prices of items of the highest quality category is approximately 500-fold greater than the amount of the markdowns on the wholesale prices of items assigned to the second category. The enterprises, all or nearly all of whose output is assigned to the first quality category, do not at all use the indicated markups and markdowns. The demand on newly assimilated products, the quality of which should conform to the highest category, is still being violated today. Enterprises do not bear responsibility for this, and its forms so far have not been established, although in essence it is a matter of national assets which are being spent to no purpose.

Different demands are being made on the end results of the activity of ministries and all-union industrial associations. The indicators of the degree of satisfaction of the public demand for the products being manufactured, the national economic efficiency of production and effectiveness of capital investments are being placed in the forefront here. In our opinion, their use promotes to the utmost the solution of the problems formulated in the decrees of the CPSU Central Committee and the USSR Council of Ministers on questions of the improvement of the economic mechanism.

The ministries are first of all responsible for meeting public needs. They should correctly determine the current and long-range needs of the national economy for products, keep track of the technical level of production, develop the necessary capacities and so on.

However, the precise functions, rights and duties of the main ministries have not been established, just as the forms of their interrelations with other manufacturing ministries have not. The main ministries do not have an appreciable influence on the increase of the technical level and growth rate of the production volumes of

the products attached to them, therefore their responsibility for the end results--the satisfaction of the demands of the national economy--so far is not backed by either economic or administrative measures of influence.

The increase of product quality, as was already noted, affects the degree of satisfaction of public demand. Such measures as the evaluation of its technical level, the preparation of proposals on the discontinuation of obsolete items, the making of an extradepartmental appraisal of the technical and economic indicators of the most important types of items and technological processes (both at the stage of the performance specifications and the end results), the establishment of standards and the improvement of the metrological equipment of production occupy an important place in the solution of this problem. Their implementation should become one of the criteria of the evaluation of the work quality of ministries and all-union industrial associations.

The ultimate indicators of production cannot be improved without the comprehensive, systems improvement of the raw materials and items of general machine building use (drives and transfer equipment, hydraulic and pneumatic control equipment and automatic devices, lubricating and filtering equipment). The USSR State Committee for Standards and the ministries are obligated to complete in the next two years the drafting of comprehensive programs of the standardization of consumer goods with allowance made for the demands on raw materials, materials and components, to revise the obsolete standards for machinery and equipment, to draft a program of operations on the standardization and specialization of the production of items of general machine building use and similar application. But this work in the ministries is being developed slowly, although the corresponding proposals should already be reflected in the plan for the 11th Five-Year Plan.

A large set of measures, which are aimed at increasing the degree of satisfaction of the needs of society, touches upon such aspects of economic activity as the improvement of the level of the balance of the assignments of the state plans, the improvement of the forms of material and technical supply and trade and the strengthening of the economic contractual ties between the producers of products and the organizations which sell them.

The established procedure of elaborating the system of balances of material resources and the plans of their distribution creates the conditions for the preparation of the plans of the development of the sectors of industry for the next few years and the future and the stabilization of production ties on the basis of contracts.

Territorial balances of the production and distribution of products will be compiled for the first time in the practice of planning. This will make it possible to combine better the sectorial and territorial plans and to meet more completely the needs of the population and industry with allowance made for climatic conditions and other local peculiarities. These balances will play an important role in solving questions of the efficient location of the productive forces of the country and the development of large regions and the most important territorial production complexes. Such balances also ensure the coordination of all types of transport by working out a plan of the optimum freight flows.

The duty placed upon USSR Gosplan to expand the guaranteed complete supply of associations and enterprises with material resources, as well as the practice of

concluding five-year agreements between the organizations of the Ministry of Trade and the industrial ministries, associations and enterprises, which produce consumer goods, and annual contracts, which provide for the updating of the assortment, the improvement of the finish and packaging of goods, and others are also aimed at the improvement of the satisfaction of public demands.

Let us examine another characteristic of the end results of the activity of ministries and all-union industrial associations--the national economic production efficiency. The experience of the Ministry of the Electrical Equipment Industry and the Ministry of Tractor and Agricultural Machine Building on determining the total impact from the production of products and their use in the national economy is well known. The consideration of the impact, which is obtained by the consumers of products with higher technical and economic parameters, substantially augments, and in some instances also changes fundamentally the evaluation of the operation of enterprises and associations. However, practice attests to the imperfection of the methods of determining the impact for the consumers of the products. It is a matter not of the actual impact, but of the estimated, standard impact, which is often overstated, in spite of the confirmation of the consumer. First, the consumers of products do not have the methods resources to check the correctness of the amounts of the impact which was calculated by the producers (it is possible only to repeat the calculations made by them). Second, the consumers, just as the producers, do not bear responsibility for the reliability of the determination of the impact.

The economic impact from the implementation of scientific and technical measures has been included among the approved indicators of the plan. It is determined not according to the increase of the profit, but according to the saving from the reduction of the production cost. Therefore, there is no unity between the methods of determining the national economic impact from the production and use of products and the calculation of the economic impact from the implementation of scientific and technical measures. In our opinion, they should be organized according to the same principle.

In some instances the "impact" can also be negative, and the expenditures on the improvement of the parameters of items can be unjustified. This is possible in the case of the overstatement by the producer of the demands of the consumer. Thus, the service life of some unit or device is increased to 20 years, while the service life of the machine or line as a whole is 10 years. The same thing occurs when automating individual types of equipment without regard for the degree of automation of their entire set. The orientation toward the end results makes it incumbent to take into account such losses (unjustified expenditures). The latter should not be mechanically covered by increased wholesale prices, but should be assigned to the results of the economic activity of the producing enterprises.

The solution of these problems will promote the more complete consideration of the national economic impact in the system of economic stimulation and, what is the main thing, will be an effective tool for determining priorities in the development of sectors and economic regions for the purpose of progressive changes in the proportions and the increase of the efficiency of social production.

The July (1979) decree provides for a set of measures on the acceleration of the placement of production capacities into operation and the increase of the effectiveness of capital investments. Its implementation will make it possible to plan

capital investments as a unified whole with production and to allocate them to ministries not in general and not for new facilities, but for the planned increase of output and services.

The indicator of the commercial construction output, which characterizes the end result--the enterprises, sections and start-up complexes, which have been turned over to the client and are completely ready for the output of products--is being introduced as one of the main indicators for organizations which perform construction and installation work. As compared with the total amount of construction and installation work this indicator is a step ahead in planning.

At the same time it is well known that the cost of construction materials and components takes up a considerable proportion in the amount of construction and installation work. As a result with a nearly equal machine-worker ratio at construction projects, but a different structure of the work being performed and cost of the materials being used the annual output per worker will range from 5,000 to 100,000 rubles. That is why it is important to expedite the changeover in construction to the use of the indicator of the net construction output, which in physical composition is analogous to the commodity output, but in value differs from it by the amount of the material expenditures.

The decision on converting, beginning in the 11th Five-Year Plan, of industrial ministries, and then associations and large enterprises to the standard method of distribution of the profit, in our opinion, will influence the increase of the national economic production efficiency. The approval of stable standards of profit withholding taxes, which are placed at the disposal of ministries, is an important prerequisite of the more complete adoption of cost accounting, for in this case an increase of the assets for internal needs is guaranteed on the condition of the improvement of the indicators of economic activity.

The standard method of distribution of the profit establishes the financial responsibility of ministries for the achievement of the planned production efficiency. This, undoubtedly, does not make the development of the sector completely dependent on its financial resources. Under the conditions of the national ownership of the means of production it is determined by national economic interests. Assets can be allocated from state resources for accelerated development. For example, the planned profit of the USSR Ministry of the Timber and Wood Processing Industry is less than 1 billion rubles. The amount of planned expenditures is nearly twofold greater, therefore a part of them is being covered from the state budget. The shortage of internal resources for the financing of expanded reproduction cannot prevent the changeover to the standard method of distribution of the profit.

The standard method is a successful form of the combination of the interests of the state and ministries or associations. The guarantee of payments to the budget attests to the observance of the interests of the state. If the actual amount of the balance sheet profit is less, the guilty party--the ministry, the association--will suffer. The portion of the profit, which is left at their disposal, is reduced accordingly. This affects first of all the economic stimulation funds. If the ministry does not have enough assets to cover the planned expenditures, it can make use of bank credit with the payment of a specific interest.

With the introduction of the standard method of distribution of the profit the entire above-plan profit is not paid to the budget as the net surplus, but a

significant portion of it can be used for the further development of production and the increase of its efficiency, for the meeting of social needs and for the direct material stimulation of and payment of bonuses to production leaders. This measure induces economic units to adopt stepped-up annual plans which exceed the assignment of the five-year plan.

The achievement of high end results depends not only on the use of the new plan indicators, but also on the good organization and coordination of the work of all the links of the national economy and their responsibility for meeting the public needs.

The policy of great efficiency and work quality naturally increases the role and importance of the indicator of the final social product.

The final product is the portion of the gross national product, which finally leaves the sphere of current production and is intended for consumption, accumulation, export, as well as the replacement of the means of labor, which were used during the year. Another part of it is the intermediate product, which is the value of the raw materials, materials, fuel and electric power, which were produced during the given year and were used for production needs, that is, for the output of the final product.

By physical composition the final product consists of consumer items, means of labor and a portion of the objects of labor (raw materials, materials, fuel, power), which is used for increasing reserves and for export. Thus, all consumer items belong entirely to the final product. All objects of labor belong, as a rule, to the intermediate product, except that portion, which goes for accumulation, the increase of reserves and export. Machines and equipment, which are used as means of labor, are a final product, while those used as components are an intermediate product.

The intermediate product, which for the national economy is not the result of production, but material expenditures, constitutes more than half of the gross national product. Not only the value of the material resources used during the year, but also the double (at times multiple) counting of the value of the same products are included in the value of the aggregate or gross product. Therefore an increase of the gross product can be achieved in part by an increase of the material expenditures, that is, by an increase of the materials-output ratio of production.

Society is interested in the maximization not of the gross product, but of the final product. If its planned amount can be achieved with a smaller amount of the gross product, this will attest to an increase of the efficiency of social production. On the other hand, if the increase of the national product is not accompanied by an increase of the final product, this attests to the irrational increase of material expenditures. Therefore the final product should be the goal of production. The amount and composition of the gross product are only auxiliary indicators, by means of which it is determined.

One must not, however, also underestimate the importance of the planning of the intermediate product. Its composition and dynamics require close attention. The intermediate product is the direct result of the social division of labor, the differentiation of sectors and the specialization of production. It is obvious that the higher the level of the specialization of production is, the greater the number of stages and individual processes it is broken down into, the greater the number of

independent enterprises which produce only parts, assemblies and semimanufactures and, consequently, the greater the amount of the intermediate product is. Therefore its amount should constantly increase, and at a fast rate, but so that in this case the corresponding increase of the amount of the final product would be ensured and the total expenditures of all types of resources per unit of the final product (in comparable prices and under comparable conditions) would decrease without fail.

The specialization of production is one of the most important factors of the increase of labor productivity. Its development leads to a decrease of production costs, and even without a change in its technical level. At the same time it not only creates the conditions, but also requires the radical improvement of the means of production, thereby acting as a powerful accelerator of scientific and technical progress. Consequently, the increase of production efficiency and the decrease of the socially necessary expenditures of labor per unit of the final product should be the criterion of the development of specialization.

However, there are still many unsolved organizational and methods questions in the planning of the development of specialization. In practice it has been turned over to ministries and departments without adequate monitoring on the part of planning organs. An effective tool of the monitoring of the effectiveness of specialization so far has not been developed.

The correlation of the amounts and growth rates of the final and intermediate product, in our opinion, can act as such a tool, for precisely it expresses the effectiveness of the development of production specialization and, what is very important, can be traced at different levels of management.

Any increase of the intermediate product should be accompanied by an increase of the final product. If we keep track only of the dynamics of the gross product, this requirement may at times be violated. The point is that an increase of the intermediate product automatically entails an increase of the gross product, while for an increase of the final product it is still necessary to ensure without fail the efficient use of resources.

The increase of the intermediate product can outstrip the increase of the final product, but the total expenditures of living and embodied labor per unit of the latter nevertheless should decrease here. Without the separate planning of the final and intermediate product this important criterion drops out of the analysis.

Thus, the introduction of the separate planning and accounting of the final and intermediate product will make it possible not only to control the process of the development of production specialization, but also to monitor the change in the composition of the gross product, by achieving the preferential growth of the final product and the increase of the efficiency of social production through the reduction of the socially necessary expenditures.

The introduction in practice of the separate planning of the final and intermediate product and the analysis of their correlation are of particular important for the processing sectors of industry (machine building, metallurgy, the timber and wood processing, chemical and petrochemical, light and food industries). It is advisable to make the analysis of the correlation primarily at the level of ministries and industrial associations. This is dictated by the fact that today the production

ties between the enterprises of one ministry or all-union industrial association are poorly developed, especially in machine building, in which item-by-item specialization, in case of which each enterprise manufactures a product through the entire technological cycle, as a rule, predominates.

The proportion of interplant cooperative within the ministries and all-union industrial associations is negligible and is increasing slowly. The existing deliveries are usually limited to some types of unfinished work pieces. At many machine building all-union industrial associations the proportion of the intermediate product does not exceed 2-3 percent. The coordination links between ministries are being poorly developed. The exchange of the intermediate product between them takes place mainly through the plan of material and technical supply, which complicates the establishment of direct production ties, creates difficulties in the construction of industrywide structures and facilities and does not make it possible to optimize the capacities for the output of products of general machine building use, particularly various types of unfinished work pieces.

An opportunity to improve the standardization of material, manpower and financial resources with allowance made for the demands for them, which are determined according to the output of the final product, is afforded with the introduction of the separate planning and accounting of the output of the intermediate and final product. The problem is that great difficulties are still being encountered with the establishment of a list of products, for which resources should and should not be allocated, since they are already taken into account when planning the output of products of a higher rank.

The lack of a division of output into the final and intermediate product constantly makes itself felt when allocating material and other resources. For example, manpower resources are planned today for the increase of the gross product, while the development of specialization and the increase of the intermediate product, on the contrary, should lead to a reduction of the total labor expenditures per unit of the final product, since otherwise it makes no sense to create these intermediate products and it is better (at any rate, more economical) to operate in the old way.

Therefore it seems very important for stepping up the monitoring of the increase of production efficiency to establish a procedure of estimating and allocating all types of resources per unit of the final product. Initially this may be simply the recalculation of the consumed resources per unit of the final product, while later it is expedient to allocate them to the ministries only for the increase of the final product, bearing in mind that the development of specialization and the increase of the intermediate product should not so much require additional resources as lead to a significant decrease of the resources being consumed today (per unit of the final product or the effective final impact).

An effective economic tool for monitoring administrative activity and increasing the efficiency of social production emerges with the introduction of the separate planning of the final and intermediate product. The gross product reflects only the increase of production at each enterprise, while the final product also reflects the development of production ties between them. Therefore, the orientation toward the gross product is typical of the stage of extensive development, during the period of the intensive development of the economy the final product should be placed in the forefront.

The breakdown of the output into the final and intermediate product has nothing in common with the determination of the importance or national economic significance of items. The criterion of the breakdown is not the priority, but only the functional purpose of the product in the process of social production within the corresponding link. The goal of this breakdown is the more complete subordination of planning to the achievement of the end results of production and to the increase of its efficiency.

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Planning in Physical Terms

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 10, Oct 80 pp 49-58

[Article by D. Ukrainskiy, deputy chief of a department of USSR Gosplan: "The Planning of the Output of Products in Physical Terms"]

[Text] The improvement of state planning is called upon to ensure an increase of the efficiency of social production, which will be the basis of the increase of the material well-being and cultural level of the Soviet people. A special role in this process belongs to the methods of planning and the system of indicators, by means of which the state organizes the production of material wealth and evaluates the activity of production collectives. The system of plan indicators is flexible, dynamic. For the planned management of the economy this means first of all not the retention of the formed indicators and, consequently, proportions, but the purposeful establishment of new ones. The system of indicators of state planning should also be subordinate to precisely these new proportions, which are extremely necessary at each stage of our development.

The production of material wealth is the most important sphere of public activity. K. Marx wrote: "Since society cannot cease to consume, it likewise cannot cease to produce. Therefore every social process of production, which is viewed in the constant relationship and continuous flow of its renewal, is at the same time a process of reproduction."¹

The practical realization of the Marxist-Leninist thesis of the breakdown of the gross national product according to the physical and value composition is a necessary prerequisite of the scientific study of the theory of reproduction and the use of its principles in the management of the economy in the case of the planned management of the economy under the conditions of commodity-money relations.

The physical form of the gross product characterizes the quality of the means of production and consumer items, which are being produced, the volume and structure of their production, which are necessary for expanded reproduction and the satisfaction of the public and private needs of the members of society. The production of use values is a perpetual and natural condition of the existence of human society. No matter what the nature of production relations is, people should produce use values.

1. K. Marx and F. Engels, "Soch." [Works], Vol 23, p 578.

However, although the physical properties of the products of labor are also of decisive importance for the process of reproduction, the physical form of the product cannot ensure the comparison of the various products of labor, as well as the expenditures and obtained results. Therefore, the physical characteristic of the gross national product is determined by the structure of the expenditures of labor (living and embodied), of which the value form is typical under the conditions of commodity-money relations. The analysis of the dynamics of the gross product in physical and value forms governs the system of indicators as an element of national economic planning.

In the practice of planning at all stages of the building of socialism considerable attention is devoted to the plan of the output of products in physical terms. In the Methods Instructions for the Drafting of State Plans of USSR National Economic Development, which were approved by USSR Gosplan on 31 March 1980, the role of this section is defined as follows: "The plan of the output of industrial products in physical terms should ensure the satisfaction of the needs of society for means of production and consumer items with a high product quality. It is the basis for the specification in the plan of the production volume in value terms."

The result of socialist production is realized through the physical indicators of the plan. The importance of the physical composition of the national product is determined first of all by a characteristic feature of reproduction--the continuity of the processes of production and consumption, when the constant replacement of leaving (with the finished output) material resources is necessary. Of course, their replacement in its content can also be only material, physical. In the case of the planned management of the economy this feature of reproduction makes it possible by means of physical indicators to establish immediately in the plan the direct correspondence of the volume of output in concrete physical form to the volume of the need for it.

The plan of the output of products in physical terms is the main section of the state plan. It is very simple: the product mix; the units of its measurement; the amount subject to production in the period being planned; the assignments which are set for industry as a whole, for USSR ministries and departments and the councils of ministers of the union republics, which are the main producers of the given products.

The plan of the output of products in physical terms, depending on the level of planning, has a number of peculiarities. At the national economic level it is limited to a consolidated products list. It includes: products, the output of which determines the main directions, rate and proportions of the development of the national economy; the most important types of consumer items, on which the standard of living of the population depends; products, the production and use of which expedite scientific and technical progress and ensure a substantial saving of expenditures of national labor; products which are of greater importance for the development of foreign trade; products, the output of which meets the demands of defense and special needs. There are five groups in all, but the quantitative composition of the individual types of products in each of them is unlimited.

The plans of production in physical terms, which are approved by USSR ministries and departments and which include products (according to a broader products list than on the national economic level), which are distributed by USSR Gosnab, new

types of products and items, which are of great importance for the development of a sector, as well as items, which ensure the intrasectorial and intersectorial proportions and shipments of products under subcontracting arrangements, are also assigned to the sphere of centralized planning.

The broadening or abbreviation of the centrally planned products list is not an end in itself, but a means of improving planning and efficiently distributing functions among the different units of planning and economic organs. After the September (1965) CPSU Central Committee Plenum the majority of scientists and managers identified the possibility of working in a new way first of all with the amount of the approved assignments, especially according to the product mix set for enterprises. During this period the product mix approved by the USSR Council of Ministers was reduced to one-half as compared with 1963-1964 and in 1968 consisted of 615 descriptions. It was assumed that at the same time as the shortening of the centrally approved products list the responsibility of ministries, departments and enterprises for the provision of the national economy and the population with the necessary products in the complete assortment, and not just with those types of them, in which they are interested for certain reasons, should be increased.

Under these conditions the role of ministries, departments and labor collectives in the drafting and fulfillment of the state plan was enhanced. The centrally approved assignments on the output of products in the consolidated products list should have been given in detail with allowance made for the maximum satisfaction of the demands of clients directly at the enterprises both when drafting and when fulfilling the plan. However, this did not occur to the proper extent, especially at the level of the main unit of industry--the enterprise. There are several reasons for this situation.

First, in spite of the fact that at the level of the national economic plan the physical composition of the national product is the main indicator, on the basis of which the calculations on production and consumption are made, the activity of enterprises, ministries and departments is evaluated first of all according to value indicators--the total sales volume and the profit.

Second, when the total sales volume was included among the approved indicators its economic essence as a general plan indicator was not specified. It was replaced by the content of the indicator which was previously used in the financial plan of the enterprise for calculating the profit and reflected only the depersonalized act of buying and selling.

It was intended that the indicator of the sold products could perform the functions of the indicator of the planned development of production and could play the role of a tool which links production with consumption both in the plan and during its fulfillment. However, in practice the value essence of the indicator proved to be more advantageous to the supplier of the products. As a result with the systematic fulfillment and overfulfillment of the assignments on the total volume of sold products the national economy constantly does not get enough of many types of them, the production of which is called for in accordance with the products list of the national economic plan, as well as enough of specific products, which are included in the plans of ministries and the production programs of enterprises, on the basis of which supply contracts were concluded between the consumers and suppliers.

Third, to date the role of labor collectives in drawing up the drafts of state plans remains inadequate. It is frequently forgotten that every enterprise acts both as a supplier of products and as a client--the receiver of raw materials, materials and semimanufacturers. The role of the enterprise as a consumer in the formulation of the plan of production in physical terms on the basis of the assignments of the state plan is also great here.

The client needs, for example, not simply a ZIL-130 truck, but a cement carrier, a panel carrier, a flour carrier, a sugar carrier and so on. The operation of a different model will not ensure the fulfillment of the planned assignment on labor productivity and will cause expenditures, which will not make it possible to fulfill the assignments of the state plan on the profit and other indicators. That is why the requirements of the consumer on the assortment, quality and delivery dates of products within the limits of the assets allocated to him should be regarded as the specification of the state plan.

This aspect of the activity of the enterprise should be broadened. No matter in how much detail the product mix, which is approved by superior organizations, is given, it will always be a consolidated, group product mix. But for the sales process to proceed smoothly, according to the specified plan, that is, with the proper efficiency, a specific product, which is determined directly by the client, is necessary.

As a result of the enumerated and other reasons² a contradiction has arisen in the practice of managing the national economy: on the one hand, the efforts of central planning organs were aimed at the improvement of the system of the planning of production and the distribution of the output in physical terms for the purpose of the maximum satisfaction of the needs of the national economy, while, on the other hand, the method of drafting the plan of production and the sale of products, as well as the evaluation of the activity of the enterprise--the main unit of industry--were not subordinate to this requirement. On this basis the objective conditions arose for the minimization of the responsibility of suppliers and consumers to each other both at the stage of the drafting of the plan and during its fulfillment, which enable many production managers to use various means to be considered leaders while violating the assignments of the state plan.

The attempts to increase the responsibility of suppliers on the basis of the development of penalty sanctions did not yield the proper result, because, first, the amount of the fines for the underdelivery of products constitutes a negligible portion of the balance sheet profit of the enterprise (not more than 1 percent for industry as a whole); second, the granting of mutual amnesty occurs in practice (sanctions are imposed in approximately 40 out of 100 verified cases); third, a fine does not prevent the violation, but imposes a penalty for it, while such a form is alien to the relations of the socialist enterprise. Moreover, it should be borne in mind that even if a mechanism for determining the "total losses" from the harm caused by

2. The main one is the inadequate development of truly direct long-term economic ties, which are organized in accordance with the plan. It is impossible to identify them with the so-called long-term, for a number of years, attachment of enterprises for the delivery of some types of products, when all its conditions are regulated by marketing organizations.

the underdelivery of raw materials, materials or components were to be found, the portion of the profit of enterprises, which is received by the given collective as compensation, cannot in the case of the planned management of the economy make up for the physical part of the national product, which leaves in the process of reproduction, since this is not physical, but only value compensation, which does not replace the product in physical terms. Consequently, it does not make up for the losses of society.

In recent years measures of an organizational and methods nature, which covered all levels of production management, were adopted for the purpose of increasing the attention of planning and economic organs and enterprises toward the assignments of the plan in physical terms. The process of the concentration of production, which was begun in accordance with the plan in industry following the adoption by the CPSU Central Committee and the USSR Council of Ministers in March 1973 of the decree "On Some Measures to Further Improve the Management of Industry," should be regarded precisely from this angle. But the analysis of the work of many enterprises showed that far from all of them were able to realize the potentials of the new system of indicators, the new methods of the planning and stimulation of production. Nevertheless the implementation of the mentioned decree made it possible to increase considerably the level of the concentration of the production of the most important types of products of the sector.

Apart from creating the well-known advantages of large-scale production as a result of the concentration of production and the consolidation of enterprises, an enormous number of external economic ties are being transformed into the internal ties of associations; the need to plan from above the industrial production volumes and the output of many types of products in physical terms is thereby being eliminated. At present the proportion of the industrial output, which is produced by 4,000 production associations, has reached 46.7 percent of the total volume of sold industrial products as against 6.7 percent in 1970.

Taking into account the great impact of this direction of the concentration of production, the decree of the CPSU Central Committee and the USSR Council of Ministers of 12 July 1979 calls for the completion in the next two to three years the formation of production associations as the main cost accounting unit of industry. USSR Gosplan jointly with interested USSR ministries and departments is obligated by the same decree to carry out the changeover to the planning of the production of equipment according to an enlarged products list and to make the necessary changes in the system of physical measurers.

At present considerable work is being carried out on the improvement of the mix of products, which are planned and approved in the state plan, and on the increase of the scale of its use, which is stipulated in the plans of production, the material balances and the plans of distribution among the main holders of capital. This concerns both the quantity and the units of measurement of the output. Two directions occur in the indicated work.

The first is the enlargement by the sectorial and consolidated departments of USSR Gosplan of the mix of planned output for the purpose of ensuring the balance of the plan. The estimates, which are made using computer equipment, for determining the need of machine building and metalworking for rolled metal products can serve as an example. These estimates cover a detailed product mix, which includes more than

9,000 descriptions, while the output of products of 2,500 descriptions is called for by the assignments of the state plan for this industry.

The second direction is the enlargement of the product mix which is approved in the plan. It should not be identified with the estimated product mix, which is used extensively when determining the material resources. The approved mix is of great importance for the planning of the profit and the indicators on labor, since the level of the profitability and the level of the labor-output ratio of various types of products are not the same. In the past 10-12 years the approved product mix in the state plans has been continuously enlarged. Whereas in the plans of 1968-1970 it came to approximately 2,700 descriptions, about 4,000 descriptions of products of the approved mix are envisaged in the draft of the plan for 1981.

The need for the planning and approval of a larger and larger number of types of products within the indicators of the state plan concerns primarily machine building and ferrous metallurgy, which is connected with the planned introduction in the national economy of advanced machinery, equipment and rolled metal products.

At the level of the national economic plan due to the unity of all the spheres of reproduction estimates on the output of products are impossible without the use of material balances and plans of the distribution of products among their main users (holders of capital). At the basis of the balances and plans of distribution is the dynamics of the physical composition of the national product; this also ensures the unity of the planned products list and the units of its measurement with the plan of production.

The central planning and economic organs when performing various functions in the process of distributing the national product are guided by specific organizational and methods principles. Thus, when performing the preliminary work on the compilation of the draft of the state plan for the 11th Five-Year Plan and implementing the decree of the CPSU Central Committee and the USSR Council of Ministers "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality," USSR Gosplan and USSR Gossnab determined the mix of products, the balances and plans of the distribution of which will be compiled and approved accordingly by USSR Gosplan, USSR Gossnab, USSR ministries and departments and the councils of ministers of the union republics. The following requirements formed the basis for this activity: USSR Gosplan elaborates the balances and plans of the distribution of products of intersectorial use, which determine the rate and proportions of the development of external economic ties, as well as the most important individual types of scarce products and products which are imported in a significant volume.

Within the main directions of USSR economic and social development for the future, in the balances for the final years of the five-year plan the mix of such products encompasses tens of types. There are far fewer types of products, for which USSR Gosplan elaborates material balances for a five-year period, as well as plans of distribution among the main holders of capital (by years of the five-year plan). Let us note that in the coming years as compared with the 10th Five-Year Plan the composition of the balances has been enlarged significantly: previously it covered more than 200 types of products, while plans of the output were not drafted for the holders of capital. And not only was the mix enlarged, but the number of holders of capital (ministries, departments, the councils of ministers of the union

republics) also increased; the proportion of the total consumption of resources by them amounts to 65-85 percent.

Within the annual plans of USSR economic and social development USSR Gosplan has to elaborate balances of material resources and plans of their distribution according to a more detailed mix. Some of them are submitted for approval to the USSR Council of Ministers.

USSR Gosplan distributes a considerable product mix.

The total number of material balances, which are being elaborated within the annual plan for 1980, covers several thousands of types of products, which considerably exceeds the mix, on the basis of which the assignments of the state plan in physical terms are approved. When compiling the material balances the physical indicators are subdivided for the purpose of obtaining in the balances more reliable data on the need for products. The main shortcoming of physical indicators is connected with this: they can reliably compare only more or less similar products, the entire amount of which has similar properties. Therefore it is difficult to reflect by means of these indicators the consumer properties of products, which have a multipurpose use, and it is impossible to measure the actual amount of the consumer properties of dissimilar items, even if they are interchangeable. This makes it necessary to subdivide the product mix and to elaborate a large number of special balances, to seek the most perfect units of the measurement of output.

By using the appropriate measurers it is possible to characterize the output of products by the indicators of quantity, weight and volume. It is possible to characterize these products through the use value in the indicators adopted for each type, such as the capacity, the lifting capacity, the heating capacity, the content of useful substances per unit of weight and so forth. At the level of the national economic plan both groups of indicators are necessary. The former, in characterizing the physical volume of production, is necessary for determining the effectiveness of the use of production capacities, the freight turnover, the total expenditures on the planned production volume, the need for material and manpower resources. The latter, which characterizes the use value of the product, is more suitable for the balancing of the production volumes with the needs of the national economy for products for industrial production purposes and consumer goods.

Owing to the indicated circumstances the structure of the units of measurement changes. Whereas several years ago the indicators of quantity, weight and volume predominated, which corresponded to the use of such value indicators as the gross and commodity production, now the composition of the measurers of production is oriented toward the maximum reflection of the consumer properties. This problem can be resolved most completely with the simultaneous efforts on the improvement of the composition of the product mix and the choice of a measurer which conforms to the improved composition.

The difficulty consists not only in the choice of a measurer, but also in the fact that the mix, which is approved at the level of the national economic plan, is being consolidated more and more, and this constantly complicates the finding of an indicator, which characterizes objectively and many-sidedly the entire group of products and its composition. Such a consolidated mix still exists in the plan, that it is impossible to judge the consumer properties of products by means of one measurer. For example, the composition of such groups of products as "Blast Furnace

Equipment," "Chemical Equipment," "Machine Tools" and others is extremely broad: the equipment included in these groups has productivity, reliability, durability and quality characteristics, which differ sharply from each other. By what measurer are these products to be appraised?

In our opinion, the most correct direction is first of all the subdivision of the mix, and not the choice of a measurer. Having singled out from the group of products "Machine Tools" the subgroup "Turning and Boring Lathes," it is possible to appraise their properties more accurately. If in this subgroup machine tools are distinguished according to other data (the diameter of the parts being machined, the number of rotations, the horsepower and so forth), the characterization of the product will reflect to an even greater extent its consumer properties, no matter in what units of measurement this is done (in items, rubles, lines, sets).

But since the products list of the national economic plan is always a consolidated list, a measurer, which has the capacity for broad generalization, should correspond to it. This, as a rule, is the weight or value indicator. And whereas the former, being a measurer of a physical magnitude, makes it possible to give a quantitative appraisal of a single property of the product (which says hardly anything about the use values of many types of products, especially in machine building), the latter, the value indicator, lacks this potential.

However, the value measurer will be used in the future at the level of the national economy. It provides a direct link between production and consumption in value terms, being abstracted from the physical composition of the product, which occurs when planning the amounts of capital investments, including for the purchase of equipment, and other material resources. In the production of consumer goods the value units of measurement (retail prices) at the level of the national economic plan provide a greater link with the volume of the commodity turnover than do physical measurers. However, the use of value measurers both for products for industrial production purposes and for consumer goods presumes the performance of work with marketing and trade organizations, ministries and enterprises on the expansion of the value amount of production to its natural composition and physical units of measurement.

Changes in the units of measurement of production affect many sections of the state plan. Taking their significance into account in the process of production, the Collegium of USSR Gosplan examines and approves their composition at the same time as the list of the product mix, according to which the assignments on production are approved in the state plan and the material balances and plans of distribution are elaborated. When preparing the necessary methods and organizational materials for the draft of the state plan for 1981 this work was performed by USSR Gosplan jointly with interested USSR ministries and departments on the basis of the requirements of the decree of the CPSU Central Committee and the USSR Council of Ministers of 12 July 1979. The changes in the units of measurement for the sectors of machine building, in which the mix of approved products has been expanded and the measurers for 70 types of them have been made more precise, are of interest.

In the assignments of the state plan on the production volume in physical terms for the majority of types of products "dual" units of measurement will be used, for example, items or thousands of horsepower for main line and industrial electric locomotives, items or thousands of kilowatts of electric power for electric motors,

millions of rubles or thousands of tons for blast furnace and steel smelting equipment and so on. Some "dual" indicators make it possible to characterize not only the consumer properties of products, but also the degree of utilization of material resources per unit of "useful properties," the effectiveness of their use, the productivity and other parameters of products. Thus, the measurers have been introduced: for lead batteries--millions of ampere-hours or thousands of tons of lead instead of just thousands of tons of lead; for crane motors--thousands of items or thousands of kilowatts of electric power instead of thousands of items; for diamond tools--thousands of carats or millions of rubles instead of millions of rubles; for various types of technological equipment--millions of rubles or thousands of tons of products instead of tons. The examples show the great potentials in the use of "dual" indicators.

In the draft of the state plan for 1981 the product mix of machine building is effectively supplemented by such a unit of measurement as "set" (170 line items). The Statute on Deliveries of Complete Sets of Technological Equipment, Technological Lines, Outfits, Means of Mechanization and Automation, Control and Monitoring,³ which regulates their designing, the drafting of the plans of production, delivery, the supervised installation of equipment and the liability as to property of the parties, has been approved. In economics literature it was previously noted that the concept "set" is imprecise, unelaborated. In the statute it is defined as follows: "The aggregate of equipment, other items and devices, which make it possible to ensure the receipt of the final product for the given technological process is... the complete set of technological equipment, the technological line, the outfit, the means of mechanization and automation, control and monitoring."

The decision that the drafts of the plans of the production and delivery of complete sets of equipment, the balances and plans of the distribution of which are approved by the USSR Council of Ministers and USSR Gosplan, are included as nominal lists and special clauses in the section "Industry" of the drafts of the state plan of USSR economic and social development, is an important circumstance which is aimed at the further balancing of the indicators of the state plan. The extensive development of the production and deliveries of complete sets of equipment means the implementation of the instructions of directive organs on the need to orient the work of industry toward the end results.

Many negative opinions are encountered in the press concerning the use in a number of sectors of industry, and first of all ferrous metallurgy, of weight indicators, that is, tons. More than two-thirds of the line items of the state plan on the output of the products of ferrous metallurgy are weight items. Now it is planned to measure the entire mix of pipe by a "dual" indicator--running meters or thousands of tons. In order to avoid the stimulating influence of the weight indicator "tons" on the increase of the weight of products, its mix when the plan of the workload is delivered to metallurgical plans and is approved by them is carefully given in detail, while the intraplant planning, the wage system, the payment of bonuses and the tallying of the results of the socialist competition of metallurgists are based on the fulfillment of the obligations on the deliveries of products in the assortment stipulated by the contract of the parties. This means the observance of all the technical indicators, which are specified by the All-Union State Standard or special conditions of deliveries.

3. "Sovershenstvovaniye khozyaystvennogo mekhanizma. Sbornik dokumentov" /Improvement of the Economic Mechanism. A Collection of Documents/, Moscow, "Pravda", 1980, p 85.

In this case for the supplier the effect of the weight measurer "ton," which, in the opinion of many economists, prompts the artificial increase of the weight of finished products (or not the promotion of its reduction), is sharply limited. At the same time for the customer, who acquires the right to order within the limits of the capital allocated to him (in tons) the necessary assortment of rolled metal products, the weight measurer acts as a limit, which induces the customer (within this weight) to order as many more products as possible in square or running meters, that is, with the minimum tolerances. With respect to the customer the weight measurer acts as a metal-saving factor. Therefore, when analyzing the use of certain units of measurement or others, it is necessary to take into account their properties with respect to both production and consumption.

The replacement of ordinary rolled metal products with those types of them, which reduce the weight of items for the customer by reducing the amount of scrap and make the process of producing machinery and equipment more technologically effective and efficient, is called for in the material balances for the purpose of saving metal. However, until very recently the production of such highly efficient types of rolled metal products was not approved in the state plan. Now the approval of the assignments on approximately two-tenths of the descriptions of rolled metal products of efficient types is being proposed.

The decision, which was adopted by the decree of the CPSU Central Committee and the USSR Council of Ministers of 12 July 1979, on the need in the evaluation of the results of the economic activity of enterprises, as well as their economic stimulation to proceed first of all from the meeting of contractual obligations on deliveries of products, is a significant step in the area of improving the economic mechanism, which is aimed at increasing the responsibility of enterprises for their observance of the dynamics of the physical composition of the national product, which is stipulated in the plan.

It is appropriate to recall here that back at the September (1965) CPSU Central Committee Plenum it was indicated that "no organization of the system of supply will be able to protect the interests of the national economy, if genuine responsibility and the adequate material incentive of enterprises and organizations in the fulfillment of economic contracts are not introduced."⁴ However, the main attention after this was aimed at increasing the financial and property liability, which did not yield the proper result for the reasons noted above. In this connection in the Main Directions of USSR National Economic Development for 1976-1980 it was indicated that the solution of the raised problem should be carried out in a different way, namely: by intensifying the dependence of the amounts of the economic stimulation funds, as well as the bonuses of workers on the degree of fulfillment by the enterprises of the contractual obligations on deliveries of products (with the retention and development of the system of penalty sanctions).

In 1979 for the enterprises of industry, which did not fulfill the contractual obligations, the material incentive funds, which were credited according to the

4. A. N. Kosygin, "Ob uluchshenii upravleniya promyshlennost'yu, sovershenstvovanii planirovaniya i usilenii ekonomicheskogo stimulirovaniya promyshlennogo proizvodstva" [On the Improvement of the Management of Industry, the Perfection of Planning and the Increase of the Economic Stimulation of Industrial Production], Moscow, Politizdat, 1965, p 50.

results of economic activity, were reduced by 128 million rubles; however, the volume of underdeliveries according to contracts is being reduced slowly. The introduction in practice of such a procedure required the use of a special method of taking into account the fulfillment of the plan assignments. The prevailing group of indicators was used: the approved indicator of the total volume of sold products and the data on the fulfillment of deliveries, which were determined directly at the enterprises.

The method of accounting is based on the use of:

the characteristic of the sales document to evaluate the activity of the collective only on the basis of that portion of the labor included in the product, which corresponds to the social needs stipulated in the plan;

the main clause of the conditions of delivery, which governs the interrelations of the parties. Its essence consists in the fact that the delivery of goods of some types, which belong to the given assortment, in a greater amount than stipulated by the contract, does not cover the underdelivery of other types. In this case society obtains an opportunity to evaluate the activity of the supply enterprise on the basis of its equal liability to each customer for the delivery of each type of product, which is called for by the contract.

In other words, in case of the nonfulfillment of the assignments and obligations on deliveries of products in the amount, on the date and in the mix (assortment), which comply with concluded contracts (orders accepted for filling) and the supply orders of foreign trade organizations, the volume of sold products with allowance made for the meeting of the obligations of their deliveries is determined by excluding the value of the undelivered products from the volume of their sales, which is called for by the plan for the period under review. The indicator "the volume of sold products with allowance made for the meeting of obligations on deliveries" has been reflected in the returns of the USSR Central Statistical Administration since 1 January 1978. Its use conforms to a greater extent to the interests of the national economy, for which the use value with allowance made for the economic impact plays a decisive role. The evaluation of the activity of the labor collective and the development of socialist cost accounting should be based on these properties of realization.

The planning of the output of products in physical terms is the basis of the assignments of the national economic plan, and its perfection reflects the improvement of the methods of planning as a whole.

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PLANNING AND PLAN IMPLEMENTATION

FEDORENKO ENDORSES LENINGRAD PLANNING INITIATIVE

Moscow EKONOMICHESKAYA GAZETA in Russian No 37, Sep 80 p 10

[Article by N. Fedorenko, academician: "A System of Comprehensive Planning"]

[Text] As the scope of the economy increases and all economic ties become more complicated, it becomes increasingly urgent to improve methods of planning regional complexes and to generalize existing achievements.

The development and introduction of a territorial system of comprehensive economic and social planning for the development of Leningrad and Leningrad Oblast, where valuable experience has been accumulated, deserves special attention.

The Svetlana Initiative

As early as the 23d CPSU Congress the Leningrad party organization issued very important proposals: to increase the comprehensiveness of the plans for the development of industrial collectives through more profound development of the social sections of the plans. In cooperation with social scientists, the Svetlana Association compiled the first long-range plan of this kind in the country, which earmarked the main directions and goals for the economic and social development of its collective. The initiative of the Leningrad workers was supported in many regions of the country. Plans for social development are now being drawn up not only in collectives of industrial enterprises and associations, but also at enterprises and organizations for transportation, construction and agriculture, and in institutions of culture and the sphere of services, as well as scientific and educational institutions, that is, in almost all branches of the national economy. More than 60,000 enterprises and associations have such plans.

Increasing the social orientation in plans, which coincides in time with our society's entry into the stage of developed socialism, corresponds to the requirements of the country's development.

In the first place, on the one hand, under the conditions of developed socialism the society has greater material capabilities of satisfying the social needs of the workers and, on the other hand, the human factor plays a greater role in the development of public production. In turn, a rise in the level of well-being, education and culture of the Soviet people becomes not only a result of the development of production, but also a most important prerequisite for its further growth and improvement.

In the second place, the scientific and technical revolution is exerting an ever increasing influence on the course of social development and is raising unprecedented social problems for mankind. Under its influence dynamic changes are taking place in the functions and conditions of human activity, the formation of the needs and interests of the people, and the organization of domestic and cultural services. Radical changes are taking place in man's relation to technical equipment, and the nature and content of labor and the human image of life are changing.

The socialist system of management opens up objective possibilities of goal-oriented and planned development of social relations.

Within the Framework of the Region

The changeover to compiling current and long-range plans for the economic and social development of administrative rayons, cities and oblasts marked a new stage in comprehensive planning. The development of regional plans serves as a logical continuation of the practice of the control of social processes in the development of individual labor collectives and the form of coordination of the efforts of many collectives in solving socio-economic problems.

The need for this kind of planning was brought about by the fact that many of the demands and interests of the workers are formed and satisfied mainly beyond the places where labor is applied -- in the sphere of administrative rayons or cities. Such problems as housing construction, urban planning, the development of transportation and communications, public health and cultural services, efficient utilization of labor resources and environmental protection are under the competence of territorial administrative agencies and cannot be resolved through the efforts of individual labor collectives.

Therefore consistent attainment of the goals of economic and social development of labor collectives requires coordination of the local plans of enterprises and organizations with plans for comprehensive economic and social development of administrative-territorial formations.

The comprehensive plan for the development of Leningrad and its oblast under the Tenth Five-Year Plan, which was prepared on the personal initiative of L.I. Brezhnev, was the first document in the practice of national economic planning which managed to embrace more fully the processes of scientific-technical, economic and socio-cultural development of a large region in their inseparable connection and interaction. The plan organically combines branch and territorial approaches to solving socio-economic problems and fulfilling the most important statewide tasks.

The main goal of this plan is to increase the contribution of workers of Leningrad and its oblast to the development of the country's national economy on the basis of accelerated rates of scientific and technical progress, increased production efficiency, improved work quality, and the development of socialist competition under the motto, "From high quality of the work of each -- to high efficiency of the labor of the collective."

The specific nature of this plan and its indisputable merits consist also in that the objects of comprehensive planning were the city and the oblast, and two lead-types of production -- industrial and agricultural. This made it possible to

coordinate measures directed toward rendering patronage assistance to rural areas, to link the demands of the urban population for food products with the possibilities of satisfying them through local resources, to take into account the pendulum migration of the population and to plan better the elements of a unified infrastructure.

Comprehensiveness of planning for the economic and social development of urbanized city zones and agrarian regions adjacent to them also makes it possible to solve better such a social problem as overcoming the social differences caused by the lack of uniformity in the assimilation of territories and the fact that people live under conditions that are not equally favorable for labor activity and life.

A Unified System

The drawing up of the plan for the city and oblast under the Tenth Five-Year Plan completed the formation of a unified territorial system for comprehensive economic and social planning of a region that includes three levels of administration: the enterprise (association), the administrative rayon (city and oblast) and the city and oblast themselves. It reflected many years of experience of the Leningrad party organization which headed all the work for conducting preplanning research and development, and organization and supervision of the socio-economic planning in the region. The council for economic and social development that was created under the CPSU obkom provided direct leadership of this complicated and interesting work.

Comprehensive planning is based on the interaction of branch and territorial plans and the coordination of indicators of branch development with territorial resources and the needs of the region's population. The immense scope of production and the sphere of services, the numerous profiles of the economy and the complexity of the multibranch urban economy made the solution to this problem considerably more difficult.

Suffice it to say that on the territory of the city and the oblast there are functioning enterprises and organizations under the jurisdiction of more than 150 ministries and departments, that is, almost all branches of the national economy are represented. The ministries and departments, when solving their own production problems, frequently do not take the territory's resources into account adequately and have a poor idea of the amounts of resources and limiting factors. This is why there is a persistent need to develop and coordinate a comprehensive plan in three cross sections -- departmental, branch and territorial. As part of the main directions of the comprehensive plan, a number of programs were also developed for the long-range future -- up to 1990.

All this work resulted in the following planning documents:

comprehensive plans for enterprises and organizations of the city and oblast;

summary comprehensive plans for enterprises and organizations under the jurisdiction of each ministry (department);

summary comprehensive plans for the development of branches of the national economy;

comprehensive plans for the development of administrative rayons of the city and oblast;

summary territorial comprehensive plans for the development of the city, oblast and region.

During the course of the development of the plan a large amount of economic and social research was conducted, as were balance and other calculations related to increasing the production efficiency and scientific potential of the city and oblast. The experience in comprehensive territorial planning at the level of production associations, administrative rayons and the city as a whole were studied attentively and generalized at scientific-practical conferences, numerous seminars of the party-economic aktiv, and in scientific methodological developments.

Social Aspects

The comprehensive plan for the development of the region was a reliable basis for solving a whole number of socio-economic problems: improving the system for the administration of industry through concentration of production and reinforcement of its ties with science; improving the branch structure of the industrial complex and the removal beyond the city and oblast limits of enterprises and industries that are not of the correct profile and that are harmful in terms of sanitation.

The implementation of this plan contributed to eliminating unjustifiable differences in the conditions for the labor, life and recreation of workers who are employed at enterprises of various ministries, and to the improvement of the system of vocational and technical education and other forms of training labor personnel. The plan also helped to make a demographic prognosis of the population up to 1990 and to solve problems of efficient utilization of labor resources on the basis of scientific and technical progress.

As a result, almost all of the increase in the volumes of production of products under the Tenth Five-Year Plan in industry and other branches of the economy of Leningrad and the oblast are being achieved through increased labor productivity. During the years of the five-year plan the real per capital income is increasing by an average of more than 20 percent for the city and the oblast. The problem of providing children's preschool institutions is basically being solved. The material and technical base for vocational and technical education has been radically strengthened.

The experience of the Leningrad workers becomes especially important under the conditions of the introduction of new methods of management. Measures of the party and government for further improving the economic mechanism envision, as we know, increased comprehensiveness in planning. Summary sections for the entire complex of measures in the area of social development are included in state plans for the economic and social development of facilities of both branch and territorial jurisdiction of all levels of administration.

The territorial system of comprehensive economic and social planning that was developed in Leningrad and Leningrad Oblast has been approved in a decree of the CPSU

Central Committee and the USSR Council of Ministers, "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing the Efficiency of Production and the Quality of Work." There is no doubt that the Leningrad experience in comprehensive planning can be extensively utilized in the matter of improving the economic mechanism and strengthening its influence on increasing the efficiency of production and the quality of work.

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ECONOMIC MODELING AND COMPUTER TECHNOLOGY APPLICATION

OVERALL ECONOMIC PLANNING MODELS DEVELOPED

Moscow *EKONOMIKA I MATEMATICHESKIYE METODY* in Russian No 5, Sep-Oct 80
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[Article by V. A. Zhitkov, Yu. R. Leybkind, V. P. Presnyakov, B. G. Saltykov and Ye. G. Yasin, Moscow: "The Problem of Building Models of the Economic Mechanism in the System of Integrated Planning"; submitted 4 June 1980]

[Text] The problems of improving planning have recently been at the center of attention of economic science and practice. The results of research done in this field are quite well known; some of them are being applied in the work of planning agencies. For instance, in accordance with the decree of the CPSU Central Committee and USSR Council of Ministers adopted 12 July 1979 and entitled "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality," during the 11th Five-Year Plan fuller mutual linkage is to be achieved among the elements of the system of national economic plans, extensive use is to be made of the target-program method of planning and management, the time frame of planning is to be extended, and so on. This decree aims at further improvement of centralized planning and at organic inclusion of long-range economic standards among planning indicators in order to increase the effectiveness of managing socialist production. The question of intensifying efforts in that direction and of creating the instrumental procedures for linking the plan and the economic mechanism has been put on the agenda.

The SKP [integrated planning system or system of linked plans] worked out by TsEMI [Central Mathematical Economics Institute] [1] calls for economic standards to be correlated with the respective physical indicators of the plan. For those aspects of this question which have to do with methods and even more procedures have not been sufficiently studied. There has been too little study of the problem of the impact of the economic mechanism on the process of compiling and carrying out the plan. Nor have the problems of appropriate representation of the economic mechanism in mathematical-economic models been solved as they should be.

Until recently both planning practice and a majority of the most widespread models for optimization of planning decisions were oriented primarily toward the technological aspect. In this context planning came down mainly to the establishment of assignments for each participant and allocation to him of the resources necessary for their fulfillment. Given this approach, out of the entire great diversity of socioeconomic relations, only technological interconnections, rather rigidly determined by the level of development attained in engineering and technology, are taken individually.

More thorough study of the problems of correlating planning and the economic mechanism necessitates that greater attention be paid to the economic aspect of the plan at a time when it has been proposed that an internally linked system of economic managerial impacts be worked out so that by influencing the decisions made by participants in social production themselves, it would orient them toward achievement of the goals of development of socialist society. In this case the economy is represented as the sum total of interacting economic entities--enterprises, organizations, and so on, which, as they perform their specific functions in the unified national economic complex and consume the resources necessary for that purpose, perform a role in which they embody the interests of society, collective interests and personal interests.

We should note that this view of the economic system is by no means the antithesis of the first: integrated planning necessitates that the object being planned be viewed from different angles that complement one another, so that in the end it can be comprehensively reflected in the plan.

In our view the central problem whose solution is crucial to success in perfecting planning methodology and the adequacy of model representations of the real economy and to expansion of the sphere of application of mathematical-economic models in planning practice is the representation of the interests of economic entities in planning methods and models. In this connection we need to recall that representatives of the mathematical economics school of thought formulated at the very outset of its development the principle of the unity of the technological and economic aspects of the plan, proposing that the process of drafting the plan be combined with determination of the values of economic parameters acting as incentives for its fulfillment.

Later there was a natural evolution from the simple constructions in which the diversity of interests and goals of economic entities was modeled by a single payoff function, and the economic mechanism by a system of optimum estimates, in the direction of more adequate representation of interests. We should note in particular the greater attention paid to the principle of indeterminacy in the economy [2], to constructing systems of models in which the interests of various entities have been simulated by different criteria [3, 4, etc.], to research with models that allow for formation of the goals of social development in the process of the functioning of a system in which man participates [5]. While noting the very valuable results

obtained in the process of this evolution, we cannot but admit that a satisfactory solution has not yet been found to the problem. In our view the main reason for this is that representation of the object being modeled has in a number of cases been oriented toward the possibilities of applying specific formal methods, especially with respect to modeling the interests of entities by criteria which have been normatively given.

It is obvious that a real system of integrated planning, which would be capable of working out effective incentives that would ensure correlation of heterogeneous and sometimes contradictory interests of the participants in social reproduction, should be based on a more adequate representation of the object being planned--in particular, should possess a realistic representation of the behavior of interacting economic entities and of the influence of regulating actions on that behavior. It seems important to us, then, to consistently pursue the principle of discriminating between models of the subjects being planned and models of planning processes [6, 7]. Models of processes are expected to improve the technology of the drafting of plans, including the devising of economic standards; models of subjects of planning are called upon to describe the behavior of entities under the conditions of operation of the planning scheme that has been adopted and economic incentives (and possibly even for different versions of plans), and its influence on the end results of the functioning of the economy. Thus a model of a subject of planning should play the role of a kind of testing ground with which the process of drafting the plan would be supplemented by a check on the possibilities of its being carried out.

The place of the models of the subjects of planning and of planning processes in the SKP is shown in its general aspects in Figure 1. The prescription block defines the goals of the country's development [1] and the basic variants of the system of management through planning in the economic mechanism (including the requirements to be met by the system of plans, allocation of powers in the disposition of resources, the system of economic incentives, the general rules governing interrelations among participants in social reproduction). Specific schemes of planning and economic incentives, including systems of indicators and economic parameters and methods of their formation typical of them, are constructed on this basis. Optimization and other models for substantiation of planning decisions are adjusted within them. These schemes are models of the planning process, which can influence in different ways the behavior of economic entities and which are characterized by a differing degree of effectiveness. An assessment of the possible results of implementing one or the other scheme can be obtained on the testing ground--a model of the socioeconomic system as a subject of planning. The results are used in the planning process above all for selection and revision of the scheme itself and for correction of the most important planning and incentive indicators. The different versions of plans, as well as the results we have mentioned, are transmitted to the prescription block, which makes the final decisions. Thereafter the indicators of the plan and the economic standards determined in accordance with the scheme that has been adopted are broken down to entities in the

real socioeconomic system. The output data of its functioning are summarized by the information system.

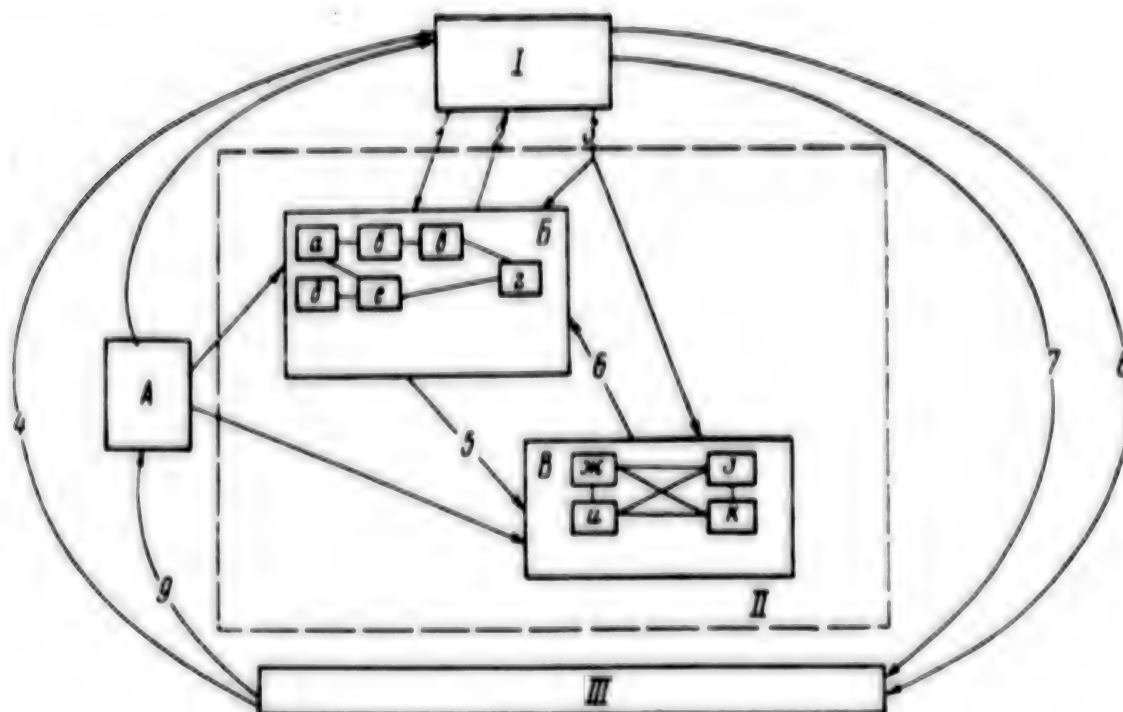


Figure 1. Structure of the system of integrated planning: I--prescription block; II--system of integrated planning; III--socioeconomic system; A--information system; B--flowchart of the planning process; B--model of the subject of planning--testing ground; 1--goals of the country's development; 2--draft of the plan and corresponding variants of the system of management by means of economic plan; 3--variants of the system of management by means of planning and the economic mechanism; 4--interests and goals of socioeconomic entities; 5--variants of the plan and economic standards; 6--results of testing fulfillment of the plan; 7--the variant of the system of management through plans and the economic mechanism adopted; 8--the plan; 9--results of socioeconomic development; a--goals of the plan; б--programs; в--sectoral and regional plans; г--plan; д--forecasts; е--economic standards; ж, з, и, к--models of the functioning of economic entities.

We should note the relative nature of the division of models of subjects of planning from models of planning processes. Any economic entity can be described in the terms of models of the subject of planning and models of the planning process, and they both prove to be components of the models of the subject of planning for the supersystem managing the activity of the entity under consideration. Without including both types of components within it, it is not possible to adequately represent the behavior of the entities

being managed under specific conditions. Moreover, when models of the subject of planning and models of the planning process are constructed for the level of national economic planning, we should bear in mind the need of their subsequent conjugation in the course of their joint use.

The model of the planning process at the level of the national economy is presented in its basic features in [1] and [8]. Very broad opportunities, of course, still remain for its improvement. In the present article attention will be concentrated on the problems of constructing a model of the subject of planning--the testing ground for national economic planning, indeed at present the testing ground for one problem--checking the different schemes of planning and economic incentives.

The following characteristics of the economy must be reflected in such a model. First of all, as has been indicated, it is viewed as a set of interacting entities, each of which is structuring its behavior so as to take into account both the goals of society and also its own interests, as well as the resources available and technological, economic and other interrelations with other entities. The available resources and connections among their components, which characterize the level achieved in development of engineering and technology, comprise natural constraints which the entities are obliged to reckon with. It is a peculiarity of these constraints that they are comparatively stable and invariant from one to the other of the different schemes of planning and economic incentives. In this sense we can also regard as invariant the functional needs of entities* and the relations of social ownership of the implements and means of production as "nuclei" of the system of economic relations of socialist society. At the same time each of the permissible schemes of planning and economic incentives contains components that define a specific system of economic interrelations among entities, rules and parameters of their interaction, which is what we ordinarily refer to as the economic mechanism in the strict sense of the word. Hereafter we will regard this as an interlink set of the following components: a) general rules of interaction of economic entities with respect to distribution of resources and their disposition, including specific forms of combination of centralized planning and economic independence of economic entities; b) system of remuneration and material incentives; c) prices and price setting; d) the financial system, including the rules of distribution of net income, even net income in the form of the charge on resources; e) credit and circulation of money.

We assume that these components can be realized in different forms, which must be correlated with one another with respect to the direction of their impact on the behavior of economic entities.

* In accordance with [9], these are needs determined independently of the means of satisfying them; in this sense they stand against the need for specific commodities, which, of course, are highly variable.

The allowable schemes of planning and economic incentives also differ in the degree to which the economic parameters of the given economic mechanism--prices, rates of remuneration, standard rates of distribution of net income, and so on--are involved in the process of drafting plans of the country's economic and social development and in the degree and specific forms whereby they are correlated with the goal indicators, resource indicators and other indicators of the plan.

As for the interests of economic entities, it is best to view them as a function of the needs of the entity, of the specific system of economic interrelations and of the entity's status within that system. If the entity is regarded in accordance with the theory of Marxism-Leninism as the sum total of all the social relations in which it takes part (K. Marx and F. Engels, "Sochineniya," Vol 3, p 3), then its economic status can be defined as the sum total of roles which it performs in the given system of economic relations. Proceeding from K. Marx' proposition of the personification of social relations, we can conclude that the roles of the entity objectively impose upon him a definite pattern of action, and that means that definite interests are imposed as well (K. Marx and F. Engels, "Sochineniya," Vol 23, pp 605-607). It therefore follows, first, that by changing the system of planning and economic incentives, by perfecting the economic mechanism and by achieving its best correlation with centralized planning, we can alter the interests of economic entities. Shaping them in the direction necessary for socialist society can be regarded as one of the tasks of long-range plans and programs. The interests that are shaped thereby can be coordinated within the framework of medium-term and current plans, and also in the process of their fulfillment by changing the values of economic parameters inherent in the given economic mechanism. Second, taking into account the multiplicity of roles performed simultaneously by each entity (and probably the multiplicity of interests inherent in them and changeability of the latter as a function of economic conditions), it is necessary to achieve more appropriate representation of the interests and goals of economic entities in the models than can be obtained by means of criteria which are normatively given.

To solve these fundamentally new planning problems we need information on the response of all the basic categories of economic entities to that set of stimulative impacts which will be produced by a specific variant of the economic mechanism. Full-fledged information of this kind can be obtained only on the basis of a sufficiently long observation of the mechanism in actual operation. As we know, full-scale economic experiments are being conducted to evaluate the proposed alternative versions of the mechanism. But the information obtained by these methods is at present obtained at a very high cost, and often it proves to be unrepresentative: the conditions of the experiment rarely can be carried over to the entire economy, so that its result loses its value to a considerable degree, especially since one can experiment in real terms only with particular incentives and measures.

In essence creating a model of the subject of planning pursues the goal of replacing the full-scale experiment with tests run on the model, which would make it possible to obtain information on the behavior of economic entities under given conditions. In setting a task of this kind, we must answer the following questions: 1) what requirements must this model meet; 2) by means of what methods should it be constructed; 3) what is the minimal configuration of the model which would make it possible to obtain data on the internal consistency, the virtues and shortcomings of the various schemes of planning and economic incentive?

The requirements for the model of the subject of planning in its general form can be reduced to the following.

1. Completeness and Integrity. The structure of the economic system--types of entities, principal forms of interaction among them, economic parameters of their regulation must be reproduced with sufficient completeness. Moreover, it is not enough to increase the dimensionality of the matrix of technological connections; one must also take into account economic relations, reflect at one and the same time the movement of physical resources, manpower, money, and flows of information.
2. Necessary Diversity. The structure of the model must provide conditions for manifestation of the behavior of entities, and therefore each of them must be granted freedom of choice in performance of the processes subject to the impacts of the scheme of planning and economic incentives being tested. Moreover the influence of all the rules and parameters of the given scheme must be revealed simultaneously, since only in this case is it possible to check the degree of their correlation with one another.
3. Invariance. The possibility under comparable technological and other external conditions of detecting the response of interacting entities to the different schemes of planning and economic incentives. Otherwise it will not be possible to compare the results of the tests.
4. Descriptiveness. The behavior of economic entities must not be determined by a criterion assigned normatively; it is indispensable to discover the decisions and actions of the entities under the conditions of the scheme of planning and economic incentives being tested and then on that basis to draw conclusions concerning interests and the criteria by which they are guided.

An analysis of the well-known types of models has shown that simulation games best meet the requirements stated above. We should note that they make it possible to reproduce the situation characteristic of real processes in the drafting of plans. Methods of simulation modeling have recently been undergoing development at a fast pace, including methods applicable to study of the economic mechanism [10-17]. The diversity of these methods in their relative newness have given rise to different views of the nature of simulation. In our opinion simulation models are first of all

those which are intended for study of the behavior of a system under consideration in time for different values of control parameters and which at the same time reproduce the physical structure of the object of control and which are not bound up a priori with the use of any sort of formal methods [17]. More than anything else, this results in the correspondence of the simulation models to the requirements stated above, but it also involves a real drawback--limitation of the possibilities of their use to study the advantages of formal methods. Moreover, when it is a question of simulating the activity of interrelated entities making decisions so as to take into account different interests and a multitude of factors, man's activity can at present, we believe, be adequately simulated only by man. In these cases people become not mere experimenters, but components of the model in their own right. It is such models that we refer to as simulation games.* As compared to other types of simulation models, they are characterized by important peculiarities to which the modes of interpretation of the results obtained and their field of application are also closely bound up. There are quite a few unsolved problems here, especially when simulation games are being used for research purposes at the level of a national economy. But a judgment about the solvability of these problems can be framed only on the basis of experience, which has yet to be built up.

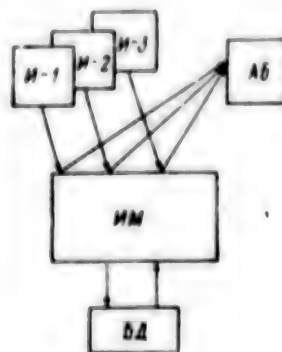


Figure 2. General representation of the simulation-game system: И-1, И-2, И-3--variants of games whose rules reproduce the conditions of the schemes of planning and economic incentives being tested; ИМ--simulation-game model of the economy; БД--data base; АБ--analytical segment.

Below we will give a description of a model of the economy as a subject of planning which we propose to construct as a simulation-game system. It is not a question of a separate imitation game, but of an imitation-game system in which it is possible to conduct tests of various schemes of planning and economic incentives.

* They are also referred to in the literature as business games, management games, socioeconomic games [14, 15].

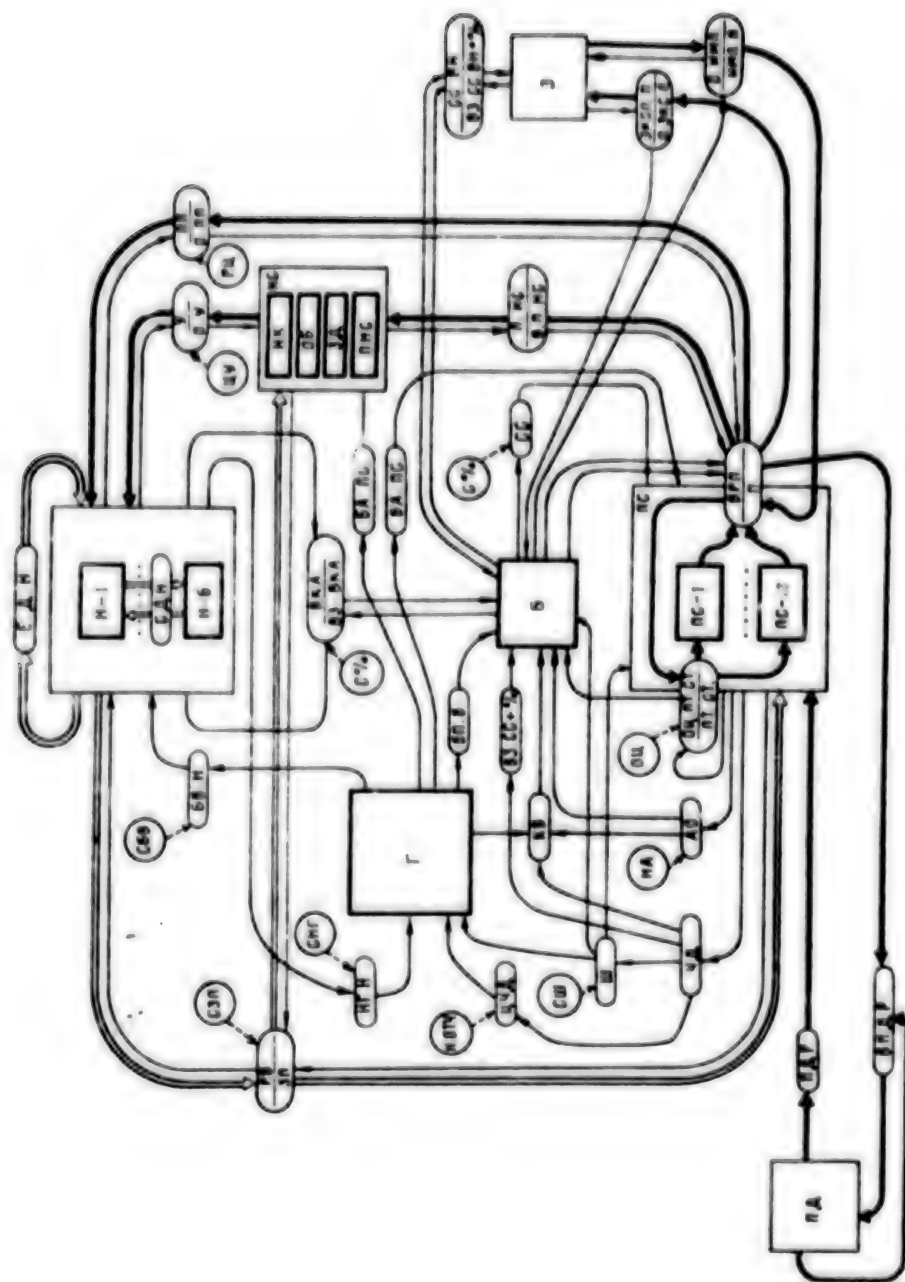


Figure 3. Structural scheme of the simulated-game model of the economy.

The peculiarities of each of them must be described for this purpose as rules of a specific game. We show in Figure 2 that the running of each such game in the context of the simulation-game model of the economy (the box ИМ), which prescribes the technological and other conditions, which are invariant to the schemes being tested, but make it possible to obtain information on the behavior of economic entities in the specific game and to compare (by means of the analytical segment) the results of the functioning of the different schemes with respect to a single system of indicators.

The consolidated structure of the simulation-game model (the box ИМ), which takes into account the requirements stated above, is represented in Figure 3. The boxes in the figure represent economic entities, the double lines represent flows of population and labor resources, the heavy lines represent flows of physical resources, the thin lines flows of money, and the dotted lines economic parameters and standards. The following notation has been used in Figure 3 (in alphabetical order): АО--depreciation deductions; Б--bank; БА. НС--budget appropriations in the nonproduction sphere; БА. ПС--budget appropriations in the production sphere; БВ. Н--nonreturnable payments to individuals (pensions, benefits, and so on); БП. Б--budgetary support of the bank; ВЗ. БКП--return of deposits; ВЗ. СС--repayment of loans; ВЗ. СС. ВН--repayment of external loans; БКП--balances of individuals; ВПДР--reproduction of natural resources; ВРП--proceeds from product sales; Г--the state; ЕДН--natural population movement; З--foreign countries; ЗД--health care; ЗП--wages and other types of remuneration; ИМП. П--product imports; КВ--capital investments; Н--population; Н-1, ..., Н-6--population groups; НА--depreciation rate; НГ. Н--taxes on individuals; НК--science; Н. ОТЧ--rates of deduction from net income; НС--nonproduction sphere; О. ПТ. СТ, О. ПП, О. У, О. П. НС, О. ИМП, О. ЭКСП--payment respectively for the subjects of labor, the instruments of labor, consumer goods, services, products of the nonproduction sphere, imports and exports; ОБ--education; ОЦ--wholesale prices; П--output; П. НС--output for the nonproduction sphere; ПЦ--nature; ПДР--natural resources; ПНС--other sectors of the nonproduction sphere; ПП--consumer goods; ПС--production sphere; ПС-1, ..., ПС-12--production entities; ПТ--subjects of labor; РВ--work time; РЦ--wholesale prices; СБВ--rates of nonreturnable payments to individuals; СДН--social movement of the population; СЗП--wage rate; СНГ--tax rate; С%--rates of the interest on loans and bank balances; СС--loans; СС. ВН--external loans; СТ--means of labor; ЦП--rates of penalties; У--services; ЦУ--prices of services; ЦЧД--centralized net income; ЧД--net income; Ш--penalties; ЭКСП. П--product exports; %--interest on bank balances and loans.

We will describe the model under consideration in greater detail. It describes the functioning of the country's economy under the conditions of the scheme of planning and economic incentives being tested. The external environment must include boxes simulating international economic relations and natural resources. It is hypothetically demonstrated in Figure 3 that reproduction of certain types of natural resources (water, timber, fertility of the soil) occurs by natural means, but is supplemented by technological processes, whereas the scale of natural resource utilization disrupts the

balance of the natural processes of reproduction. The economic mechanism must envisage some specific form of reimbursement of the costs involved. A charge on natural resources utilized, which is collected by the state, is one such form.

Interaction of the following types of economic entities is proposed for simulation in the internal structure of the economy: production entities, whose activity takes place in the production sphere; the sectors of the nonproduction sphere; population groups, which are distinguished by characteristics that make it possible to describe their behavior as workers and consumers; the bank; an entity representing government administrative agencies, hereafter referred to as the "state." In the proposed version of the model the regional aspect is not taken up.

The makeup and number of production entities, representing collective interests, must be defined so as to reflect in the most aggregated form the physical makeup of the social product, specialization and technological relations in its production. For that purpose the structure of the social product can be represented by a small number of multisector complexes: the agroindustrial complex, the capital goods complex, and so on. In order to reconstruct the peculiarities of behavior of manufacturers of identical products we must make provision in the model for the possibility that a particular product is manufactured by a minimum of two production entities. At the same time, in order to reflect the influence of the schemes of planning and economic incentives being tested on the processes of specialization and cooperation, every such entity must be "granted the right" to manufacture products outside its specific configuration. On the basis of these considerations we need to distinguish at least 10-12 entities in the production sphere for a model of minimal configuration.

Let us discuss justification of the list of products manufactured. The goals of building the model require that each production entity be able to select its product mix, i.e., to manufacture at least two or three products within its configuration. The entire makeup of the social product must be represented on the products list, including products making it possible to describe in consolidated terms the dynamic behavior of the structure of personal consumption in connection with the rise of personal income and also the products intended for reproduction of natural resources.

A model which sets the task of discovering the impact of economic parameters--prices, wage rates, and so on--must contain not only value indicators of output, but also physical indicators of output, which can be achieved by means of representative commodities. In all, taking these considerations into account, the products list will consist of some 30 items, for each of which there must be a physical unit of measurement. Moreover, since it is not possible to plan from a single center the output of products in the full diversity of their real assortment, it is proposed that a consolidated classification with which planning agencies would work will be used in the model.

The activity of the nonproduction sphere also needs to be reflected in the model so as to take into account peculiarities of behavior of particular population groups in the context of a particular relationship between paid and gratis services, different policies governing prices of services, a shift of the makeup of demand toward services under the impact of higher personal income. But here we need not represent the circumstances of interaction in the same detail as in production, and the most important sectors of the nonproduction sphere—science, education and health care—are taken as entities. The other sectors should either be included in the production infrastructure (transportation, communications, housing and utilities and consumer services), or lumped together in the box "Other Sectors of the Nonproduction Sphere," which is given as a load on the economy.

In view of the tasks which have been set, the population can be divided into groups on the basis of social characteristics—above all into urban and rural, and also with respect to the per capita level of income. The minimum number of such groups in the model is 4-6. Subsidiary farming, which would be reflected in the model as a form of use of work time and as a source of produce and money income, remains an important factor governing the behavior of the rural population.

The system of planning and the economic mechanism exert, as we know, a definite influence on distribution of families with respect to level of income and social mobility, including movement of the rural population to cities. In the model we need to take into account, then, that social movement of the population, as a result of changes in economic relations, at the same time has an effect on the composition of the needs of the population, the degree of satisfaction of those needs under specific conditions, and, accordingly, on the effectiveness of economic work incentives applied.

As an economic entity in the model the bank must represent the functions of the settlement center, credit financing and regulation of the circulation of money. It is shown in Figure 3 that flows of money of production entities going to pay for the subjects and instruments of labor, amounts of depreciation and amounts of capital investments pass through the banking system, comprising the resources of its loan fund. It is only for the sake of simplification that the money of nonproduction sectors and the state are shown moving to other entities without going through the bank. It is also assumed that all foreign economic operations would be conducted through the bank in the model.

As the representative of the interests of society, the state is given at least the following three functions in the model: a) centralized planning; the respective functions here would be specifically shaped in accordance with the conditions of the scheme of planning and economic incentives being tested; b) the functions of a financial center in which the centralized portion of the net income of production entities as well as taxes collected from individuals, which comprise the revenues of the state budget, are concentrated. These funds have been used to finance the production and

nonproduction spheres (centralized capital investments, replenishment of working capital, reimbursement of the costs of rendering gratis services), and also for nonreturnable payments for social security (pensions, benefits, scholarships); c) the functions of an analytical segment with respect to the gathering, processing and analysis of the data necessary to the working out of annual plans and economic incentive measures.

Thus two levels are distinguished. The state belongs to the upper level; the model of its activity is the model of a process, which reproduces the peculiarities of the system of planning and economic incentives being tested. At the lower level are dispersed the other entities, which in their interrelations comprise the model of the subject of planning.

The relations among separate entities depicted in Figure 3, which represent flows of materials, manpower and money, are regulated by means of direct planning assignments and (or) economic parameters. Among the latter we identify wholesale and retail prices, wage rates, rates of deductions from net income of production entities, depreciation rates, rates of penalties, tax rates, rates of nonreturnable payments to individuals, and bank rates of interest on loans and bank balances of individuals.

Methods of determining the values of these parameters, along with distribution of the functions of the entities in disposition of resources in the process of drafting plans and carrying them out must be described as part of the rules of the specific game, which simulates one of the schemes of planning and economic incentives being tested. The corresponding algorithms are arrayed to form the model of the subject of planning, which will also contain a description of all the necessary technological functionalities which are invariant to the scheme being tested.

The dynamic behavior of the technological coefficients--labor intensiveness, capital intensiveness and materials intensiveness--can be used to describe the tendencies of scientific-technical progress. But if these tendencies are to reflect the attributes of the scheme being tested, the coefficient should be determined as a result of the decisions of the entities themselves concerning adoption of new technology. Procedure and algorithms of computations, decisions and actions of each entity must also be described in the model. Decisions can be simulated by optimization problems, but the problems must be structured with respect to different criteria, and the final choice on the basis of the results of such computations is made by the person performing the role of the given entity.

As proposed, the model would be realized as follows. The simulation game, i.e., the testing of a particular scheme of planning and economic incentives, is run in a series of cycles. Entities represented by teams of players or by segments altogether simulated, carry out a sequence of decisions given so as to take into account the rules of the game, relying first on the data of the previous cycle and their own forecasts of the moves of the other entities. The players are moreover informed of their possibilities and needs; they indeed correct their plans, linking their needs and

resources to one another. If the various decisions cannot be coordinated in one iteration, the calculations, decisions and exchange of information with the other players can be repeated.

After the plans are compiled, the process of carrying them out is simulated. The entities take the actions envisaged by their internal plans: they produce, sell and receive products, they pay the corresponding amounts of money, they take and repay loans, and so on. In the course of this there are departures from the planned indicators arising either because of poor linkages or because interests have not been reconciled. For example, in the context of one of the games the state compiled a planned balance of personal income and expenditures, issued assignments for the output of consumer goods, ceilings on the wage fund and other types of personal income accordingly. After receiving these assignments and ceilings, the entities determined their production plan so as to take into account the profitability of various products to themselves. A situation could arise when within the limits of the wage funds allocated the entities would not engage the necessary number of workers. Each population group receiving money income calculates in its turn the level of per capita income attained. At a given level of income and at known prices this group must adhere to a stated pattern of its distribution and present demands for specific products. Thus relations between the demand and the supply of commodities arise in the interaction of the players. Oversupply is reflected in a growth of commodity inventories, while a shortage results in money representing unsatisfied effective demand. The rules of the game must provide for the possibility of its switching to other commodities, to savings, and so on.

Data characterizing economic development in the context of operative rules are accumulated as a result of the game. The playing out of several games will make it possible to obtain information on the relative advantages and disadvantages of the schemes of planning and economic incentives tested on the model.

In the most general outlines this is the author's conception of the purposes of creating this model and of its structure. It is evident from what we have said that even its minimal configuration, which makes it possible to study the basic peculiarities of various schemes of planning and economic incentives, must involve at least 15-20 teams of players and 5-6 segments simulating the activity of other entities in the highly complex network of relations among them. The model's dimensionality must be substantially increased in order to create a system suitable for testing specific versions of a plan. It is obvious that even building the model of minimal configuration takes time and great efforts. It is therefore advisable to do the work in stages so defined that their results can ultimately be synthesized.

At the present time projects are being conducted along the following three lines: a) construction of a consolidated model, which makes it possible to solve the problems of organizing the interaction of the entities in the

game, preserving the integrity of the thing being simulated at the expense of the necessary diversity; b) construction of partial simulation games for more detailed study of the interaction of entities in loops which particular types of resources make in their movement (loop games); c) development of detailed models of particular types of entities, production entities above all.

Below we give a brief description of the project being conducted along these lines.

The need to build and test a small-dimension game model of the national economy is dictated first of all by the large number of unsolved problems pertaining to the capabilities of the very method of simulation games with respect to modeling objects on such a scale. The overwhelming majority of the many hundreds of games created in the world simulate the activity of socioeconomic entities at lower levels--enterprises, shops, cities, and so on. The few examples of game models of a national economy known to us are used mainly for educational purposes. Accordingly a number of specific difficulties arise in constructing a game aside from the problems of mathematical-economic modeling everyone is familiar with. These are development of the corresponding model of the object and organization of the game itself as a specific form of activity simulating the real behavior of economic entities; selection of participants in the game and elimination of the so-called subjective factor, and many others.

In simulation games one must restrict the number of participants (more precisely, independent roles) to several dozen because here the well-known problem of dimensionality is manifested by a drastic increase in the complexity of the play as the number of persons making decisions increases. In a manual game where the computations for different versions in the models are performed without a computer, it is also indispensable that the models themselves be sufficiently simple. At the same time, in conformity with the principal purposes of the work, even a consolidated simulation-game model should possess features making it possible to test several versions of schemes of planning and economic incentives.

The arguments presented above have led to the game structure which follows. There are eight teams in the game, four of which represent production complexes, whose composition reproduces the sectoral structure of the economy; two are population groups, urban and rural, the latter moreover engaged in subsidiary farming; and there is one team each for the bank and the state. The production complexes each produce two products. Their resources are represented by fixed capital, the size of the labor force (available work time), production stocks, inventories of finished products and working capital in money form. The production technology is simulated by a production function with constant elasticity of substitution (CES). Two technologies--an old and a new--would be introduced into the game. The gradual transition to the latter could portray rates of realization of the advances of scientific-technical progress, which would be intermediated through the

decisions of complexes concerning capital investments. Standard construction times are introduced; they can be extended when the flow rate of capital investments is inadequate and when the items are not profitable for the capital goods complex.

All the teams managing the complexes take decisions on the structure of production, enjoying a certain freedom in this, since the state plans the output of only one consolidated product for each of them. Moreover, they must resolve the questions of labor and wages, of supply and finance.

The group representing the urban population manipulates its size, its time budget, and also money reaching it in the form of remuneration and social security benefits. It takes decisions on the use of time, on application of labor, and on purchases and expenditures. "Real" expenditures are constrained by a distribution that is a function of the per capita level of income. If effective demand, which is determined by the pattern of expenditure, is not covered for a particular group of products or services, then it is allowed (within given limits) with a demand to switch to other products, and the remainder is set aside into savings.

The actions of the rural population group differ from the urban group because of the existence of subsidiary farming as a sphere of application of labor and as a source of produce and money income. In this model the rural population can work only in the agroindustrial complex: the movement of a portion of it into other complexes is equivalent to a transfer into the urban population.

The bank performs the functions of a settlement center as well as those of credit financing and regulation of the circulation of money. It keeps the accounts of production complexes and the state, using the balances in them as the resources of the loan fund. Aside from long-term loans, the bank can also issue short-term loans, setting the rate of interest.

The most complex functions are assigned to the team acting for the state. It must shape state plans and determine the values of economic parameters in accordance with the rules simulating the scheme of planning and economic incentives being tested, manage the revenues and expenditures of the state budget, and also summarize and analyze the results of each cycle on the basis of the reports of the other teams. The complexity of these functions makes it desirable to use a computer to perform the computations they involve.

Within each cycle there are the distinct stages of planning and fulfillment of the plan. In the former all the teams move according to the rules of the scheme being tested, while in the latter they simulate the processes of production, deliveries, purchases and sales, the granting and repayment of loans, and the formation and use of money income. The circulation of money is represented by the circulation of checks, by means of which entries in the accounts are monitored by the bank and by each team separately.

To illustrate the loop game we will briefly describe a model imitating the movement of labor resources and the dynamics of labor productivity as a function of the level of remuneration and the level of commodity supply to offset worker demand for consumer goods. Its principal purpose is to reflect the chain of interdependencies arising in the loop "labor--income--consumption." All relations external to this loop are reflected with maximum simplicity. Several enterprises and the state participate in the model as players. Worker decisions on taking employment, on quitting, on purchases and expenditures, as well as the intensity of their work, are simulated by means of built-in functions.

The state sets the minimum wage rates and prices of products. In addition, it withdraws from the product produced a portion which goes for production purposes and the general needs of the state. It can also alter the procedure of deductions from the proceeds of enterprises into the incentive fund of enterprise collectives. It is assumed in this model that gratis services are distributed from this fund to the workers of the specific enterprise. Thus differences between enterprises in the possibilities of obtaining housing, health care services, recreation and child care and upbringing are simulated.

Under the economic conditions defined by the state the enterprises must make decisions concerning the level of remuneration on the basis of their needs for manpower, the situation at other enterprises and worker reaction to the level of wages adopted at a given degree of satisfaction of effective demand.

The number of workers taking employment at the particular enterprise or leaving it is simulated by the function of the difference between the average level of remuneration in past cycles so as to take into account payments from the incentive fund. The most complex problem is to reflect the functional relationship among labor productivity, the wage level and the degree of commodity coverage of effective demand. This task is solved as follows in the model we are describing.

Since the technology remains unchanged, labor productivity can be measured by the level of utilization of the work time assigned to the task. It is assumed that the amount of that time actually worked varies as a function of the level of the wage and on proportions of time-rate pay and piece-rate pay within it. This functional relationship is simulated in this model by a sinusoidal function [18].

The output of products, which is simulated by means of a simple dependence on the amount of time actually worked, is thus indirectly made dependent on the level of wages and the relationship between time-rate and piece-rate pay within it. The output goes to the market of consumer goods in the proportion set by the state, and there it is set against effective demand, which depends on the level of wages and prices. If the supply exceeds demand, then excessive inventories are created. If there is a shortage of

commodities, the unsatisfied demand is set aside to savings. The interrelationship of the movement of labor resources and the intensity of labor with the degree of commodity coverage of the wage is reflected in this model by means of a specific function and specific method.

It is proposed that a similar loop model be constructed for reproduction of fixed capital. The technological aspect of this model is presented in one of the items in the bibliography [16]. Such models make it possible to study in detail the peculiarities of modeling the interconnections of entities in reproduction of particular types of resources before they are plugged into the "large" model.

We will now examine a model of a production entity. The purpose of the model is to reflect the structure and processes of the formation of its behavior at a level of detail which corresponds to the minimal configuration model described above or is more thorough and to test on it different procedures for simulating technological processes and decisionmaking procedures. Two levels are distinguished in the model: the technological level (the model of the entity) and the management system (the model of the process). The external environment is simulated by parameters given exogenously and (or) controlled by the experimenter.

At the technological level the model is built of segments each of which simulates a particular physical and financial process: production, supply of physical resources, fixed capital, labor, finance. The processes are described by simple models, the makeup of whose parameters does not depend on decisions in the management system, which can influence only the values of the parameters. Flows linking the separate segments are regulated in their intensity at points accessible to management influence, and incoming flows can be influenced not only by the decisions of its own management system, but also by decisions of other entities. The fundamental peculiarity of the model of the technological level lies in the fact that the processes taking place in it are strictly oriented in the direction from inputs to outputs, whereas a straightforward correspondence of outputs and inputs is not observed in the opposite direction. The principal task of building the model of the technological level is to reflect as fully as possible all the functional relationships among resources of different types, their states and operations involving them and to do so in such a way that they are invariant to the different schemes of planning and economic incentives.

We should note that this level consequently turns out to be rather complex; as many as 150 control parameters are identified at this level. Moreover, decisions in this model must be taken by a human operator under the conditions of a simulation game, and only that group of parameters accessible to perception is made known to him. In this stage the way out of this difficulty, as shown in Figure 4, is found by dividing the model of the management system into two more levels: a) the level of functional decisions; b) the level of general decisions, of which the prototype would be decisions of top management.

functional decisions. The size of the penalties is set by the Director, who endeavors here to reconcile the decisions with one another and with the interests of the entity. He can also establish the priorities of functional problems. The director moreover uses the results of computations of the functional segments with respect to various criteria and the information of other entities, communication with them falling within his authority. The problem of creating an interface between the person making the decisions and the optimization models using the means of dialog between human operator and machine deserves specialized study.

It has been the purpose of this article to pose the problems. Many components of the model we have suggested in it were touched upon only cursorily and need more thorough presentation. A whole number of problems related to its creation need specialized study. Among them we should name above all interpretation of the results of tests on simulation-game models constructed for research purposes. Equally complex is the problem of developing such models to a scale that makes them suitable for testing specific variants of plans. It is also obvious that even the minimal configuration model can be realized only if adequate resources are available, including up-to-date hardware and software. Nevertheless, this line of research seems to us very promising.

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